PHYSIOLOGY.

Electrical Phenomena in Human Skin.—Tarchanoff[1] makes some interesting discoveries regarding the electrical phenomena in the human skin, accompanying the stimulation of sense-organs and different forms of psychic activity. He connects different parts of the skin with the galvanometer, *e. g.*, palm and back of hand or of foot, palm of hand and outer surface of forearm, latter and axilla, etc. Slight tickling of the body surface produces a considerable movement of the galvanometer mirror, following a latent period of from one to three seconds, and continuing sometimes for several minutes after the stimulus has ceased. Other stimuli cause similar electric currents, such as heat, cold, pain, electric shocks, sounds, such as speaking and hand-clapping, sniffing of ammonia and acetic acid vapor, sugar and other sapid substances placed upon the tongue, light thrown into the eyes as when the eyelids are merely opened to ordinary light. The author goes further and finds that merely imagining these sensations, without any stimulus of the sense-organs whatever, is sufficient to produce analogous galvanic disturbances; for example, if the individual fancies himself to be enduring intense heat, a strong cutaneous current appears. Mental processes, such as the multiplication or division of numbers, are accompanied by currents varying in intensity according to the complexity of the process; thus, arithmetical problems, the answers to which may be taken direct from the multiplication table, call forth almost no electric change. Expectation of stimuli or of questions to be answered causes irregular movements of the galvanometer mirror. Voluntary movements cause changes of an intensity proportional to the amount of movement. Fatigued individuals show little or no galvanic effects.

In all of these cases the portion of the skin richer in sweat glands becomes negative to the other portion. The author hence regards the current as a secretion current. The results go to confirm the idea that nearly every kind of nerve activity, from the simplest to the most complex, is accompanied in man by increased activity of the sweat glands, and to strengthen Hermann's view that the current exhibited in the contracted human hand is a secretion current, not a negative variation of a preexisting muscle current. In explanation of the fact of increased sweat secretion accompanying nerve activity, the author casually suggests that, inasmuch as the latter causes an increase of

[1] Pflüger's *Archiv*, Vol. XLVI., p. 46.

temperature and an accumulation of waste products, the perspiratory activity is useful as a regulator by cooling the body and eliminating the wastes.

Electrical Phenomena in Beating Heart.—Dr. Waller has investigated [2] more fully the electromotive changes in the contracting mammalian heart. The exposed and spontaneously beating heart of the cat was studied *in situ* by means of the capillary electronometer. The electrical variation of the ventricle resulting from a single beat was found to be diphasic, indicating negativity of apex followed by negativity of base. This confirms the author's former discovery by mechanical methods that the contraction of the apex precedes that of the base, which is the reverse of what takes place in the frog. Some preliminary experiments were tried on animals to determine whether the electrical variations accompanying the heart beat could be detected on the surface of the body. These were successful, and led to a study of the electrical variations of the heart in man.

It was found that leading off from points of the surface of the body remote from the heart in the intact animal or in man gave the same diphasic variation accompanying the ventricular contraction, the auricular contraction giving no electrical indication. The most favorable positions for the electrodes are on either side of a line running at right angles to the long axis of the heart. Such a "line of zero potential" in the normal human being, with heart tilted to the left, extends from the left shoulder to the right side; in the quadruped, with heart toward neither side, it is transverse to the body axis. Leading off from any point anterior to this line is equivalent to leading off from the base of the ventricles; leading off from a point posterior to this line is equivalent to leading off from the apex. Thus, in man electrodes placed on the right hand, and either the right or the left foot or left hand, gave a good variation; not so the left hand, and either the right or left foot. Favorable combinations are the mouth and the left hand, the right foot, or the left foot; an unfavorable one, the mouth and the right hand. In the cat a favorable combination is either anterior extremity with either posterior extremity, but not the two anterior extremities with each other. The electrical variation precedes the mechanical movement of the heart, and is always diphasic, indicating, as in the exposed heart, negativity of apex followed by negativity of base. It would seem, then, that in the human heart, and mammalian hearts generally, unlike the amphibian, the contrac-

[2] Philosophical Transactions, Vol. 180 (1889), B., p. 169. Cf. also Vol. 178 (1887), B., p. 215.

tion by which the ventricle empties itself begins at the apex and closes at the base.

Relations of Nerve Fibres and Ganglion Cells.—Langley and Dickinson[3] have discovered a method that promises to yield important results in the investigation of this question. In studying the effect of nicotin on the cervical sympathetic nerve they learned that after a dose of the drug stimulation of the sympathetic fibres below the superior cervical ganglion does not produce dilation of the pupil or constriction of the vessels of the ear, while stimulation above the ganglion produces both changes as usual. By applying nicotin to nerve and ganglion at different times they conclude that the poison paralyzes the ganglion nerve cells. This suggests a method of isolating the nerve fibres joining the ganglion cells from those passing through without such junction. Regarding the superior cervical ganglion, the authors conclude that the dilator fibres for the pupil, the vaso-constrictor fibres for the ear (probably also for the head generally), and the secretory fibres for the glands end in the ganglion cells. Regarding the relations of the vagus and splanchnic nerves to the ganglia of the solar plexus, it would appear that the stomachic inhibitory fibres of the splanchnic end in the cells of the cœliac ganglion, the intestinal inhibitory fibres of the splanchnic in the cells of the superior mesenteric ganglion, while the motor fibres of the vagus do not join the cells of the solar plexus; vaso-constrictor and vaso-dilator fibres of the splanchnic end in cells of the solar and renal plexuses. Other peripheral ganglia have been studied with results. The nicotin appears to affect the nerve fibres very slightly, but this effect is not to be compared in intensity with that on the nerve cells. Numerous interesting questions are suggested by the research, viz., among others, whether by nicotin centers may be isolated, and tracks followed in the brain and spinal cord.

Physiological Prize.—A member of the Physiological Society has offered two hundred and fifty dollars for the best research or researches bearing on the subject stated below, viz: "The regeneration of severed spinal nerves in mammals, including man, with special reference (1) to the reunion and return of function in such severed nerves, without degeneration of the distal portion; (2) to the possibility of union, with return of function, between the central portion of any one spinal nerve and the distal portion of any other (*e. g.*, the central portion of the ulnar with the distal portion of the median)."

[3] Proceedings of Royal Society, No. 284, p. 423.

Conclusions are to be supported, so far as possible, by histological as well as physiological evidence. The competition is limited to residents of North America, and the prize will be awarded for original work done between January 1, 1890, and October 1, 1891. Communications concerning the prize should be addressed to Professor H. Newell Martin, Johns Hopkins University, Baltimore, Md.

PSYCHOLOGY.

The Effect of Whistling on Seals.—While reading of "Instances of the Effects of Musical Sounds on Animals," by Mr. Stearns, in which I have been much interested, it recalled to my mind apparently similar effects produced upon seals, which I often noticed during a prolonged stay in Hudson's Strait. Here the Eskimo might often be seen lying at full length at the edge of an ice-floe, and, although no seals could be seen, they persistently whistled in a low note similar to that often used in calling tame pigeons, or, if words can express my meaning, like a plaintive phe-ew, few-few, the first note being prolonged at least three seconds. If there were any seals within hearing distance they were invariably attracted to the spot, and it was amusing to see them lifting themselves as high as possible out of the water, and slowly shaking their heads, as though highly delighted with the music.

Here they would remain for some time, until one perhaps more venturesome than the rest, would come within striking distance of the Eskimo, who, starting to his feet with gun or harpoon, would often change the seal's tune of joy to one of sorrow, the others making off as fast as possible.

The whistling had to be continuous, and was more effective if performed by another Eskimo a short distance back from the one lying motionless at the edge af the ice.

I may add that the experiment was often tried by myself with the same result.—F. F. PAYNE, *Toronto, March 26, 1890.*